

## ELECTRODE PACK

The invention relates to an electrode pack with at least two flat electrodes to be placed against a patient, which have flat contact areas provided with a gel on an electrode body, as well as connecting cables, and are provided with airtight connecting means.

Electrodes of this type are used in particular in connection with defibrillators and need to be always capable of functioning, in particular if they are intended to be always rapidly ready for action in connection with automatic external defibrillators (AEDs). The electrode pack is intended to assure that the contact areas are maintained in a functioning status as long as possible. Such an electrode pack is disclosed in USP 5,402,884, and similar ones also in USP 5,579,919 and USP 6,048,640. Here, the packaging seals the two electrodes in an airtight manner, and the cable is also conducted through the packaging in an airtight manner.

The object of the invention is based on making available an electrode pack of the type mentioned at the outset, which makes possible a simple manipulation and wherein packaging material is saved.

This object is attained by means of the characteristics of claim 1. In accordance with this it is provided that the closing means have sealing means which surround the contact areas and which are brought into contact in an airtight manner with the electrode bodies, wherein the connecting cables are conducted out of the electrode bodies outside of the sealing means.

With these steps the electrodes can be simply separated and removed from the packaging, wherein the connecting cables are not in the way and need not be removed

separately from the packaging material. With this construction it is also easily possible to save packaging material.

An embodiment which is advantageous in regard to handling and the construction consists in that the sealing means have an encircling seal ring arrangement, which is connected in an air-tight manner by connecting means with both electrodes and can be pulled off.

Here, an arrangement which is advantageous for the arrangement and handling consists in that the seal ring arrangement has at least one sealing bead formed on each of the facing sides of the electrode bodies which contain the contact areas, which have been brought into congruence in regard to the two electrode bodies and are connected with each by the connecting means, or that at least one seal ring, which encircles the contact areas, is arranged between the facing sides of the two electrode bodies and is connected with the electrode bodies on each of its two sides facing the electrode bodies by connecting means. In this way the electrodes are also maintained in a defined position facing each other.

If it is provided that at least one intermediate layer is arranged between the two contact areas facing each other, the contact areas are additionally protected.

A further advantageous embodiment for handling and the construction consists in that the seal ring arrangement is a part of a foil covering the contact area, which forms at least one insulating intermediate layer between the contact areas facing each other, wherein each part is connected with an associated electrode body by a respective connecting means. The packaging material can be easily removed when the electrodes are separated.

Handling is further aided in that at least one of the two electrodes is provided with a gripping tongue for pulling the two electrodes apart.

In this case an advantageous embodiment consists in that the at least one gripping tongue is connected to the seal ring arrangement, or to the at least one intermediate layer.

The functionally ready state of the electrodes is furthermore assured in that the intermediate layer is integrated as the active means for an electrical electrode test.

The invention will be explained in greater detail in what follows by means of exemplary embodiments, making reference to the drawings. Shown are in

Fig. 1A, a schematic representation of an electrode pack in cross section,

Fig. 1B, a portion of an electrode pack in Fig. 1A with a modified sealing arrangement,

Fig. 2, the electrode pack in Fig. 1A in a view from above,

Fig. 3, a further exemplary embodiment of an electrode pack in a view from the side.

Figs. 1A, 1B, 2 and 3 show different representations of an electrode pack 1, having a first and second electrode 2, 2', each of which has an electrode body 2.1, 2.1' with a contact area 2.2, 2.2' with a contact layer to be placed against a patient. The contact areas of the two electrodes 2, 2' face each other and are preferably separated by means of an intermediate layer 6. Connecting cables 5 for a connection with a control device (not represented) of a defibrillator are connected to each of the two electrode bodies 2.1, 2.1' for charging the patient with a stimulating electrical voltage and, if desired, also to perform a functional test for determining the functional capability of the electrodes 2, 2' even in the packaged state. The contact areas 2.2, 2.2' are closed in an airtight manner toward the exterior by means of a sealing arrangement with sealing means 7 and connecting means 7.1, so that the

drying out of the gel layer, which is customarily provided in the contact area 2.2, 2.2', is prevented, and the capability of the contact area to function is assured over a long period of time.

The sealing means 7 have a seal ring, which encircles the respective contact area 2.2, 2.2' in an airtight manner, as can be seen in Fig. 2, for example. The connecting cables 5 are conducted out of the respective electrode bodies 2.1, 2.1' outside of the seal ring. In this case the sealing means 7 can be embodied in different ways, as shown in Figs. 1A to 3.

In accordance with Fig. 1A, a bead-like or lip-like seal ring is formed on, glued to or welded to each of the facing sides of the electrodes 2, 2' of the electrode pack 1, on which contact areas 2.2, 2.2' are also located. In the packaged state, the two seal rings of the respective electrodes 2, 2' are congruently connected with each other in their areas adjoining each other. Various connecting means 7.1 are conceivable for the connection, which make possible the simple pulling of the electrodes 2, 2' apart from each other for their use, for example an adhesive, or their being welded together, or also a connection with a groove/protrusion arrangement, wherein the seal rings are made of a suitable elastic sealing material, for example silicon. By means of gripping tongues 4 attached to the electrode bodies 2.1, 2.1' or to the sealing arrangement 7, which protrude laterally over the edges of the electrodes 2, 2', the two electrodes can be easily grasped and pulled apart from each other. The connecting means 2.1 are here matched in such a way that they make possible the simple pulling apart and, on the other hand, assure an airtight closure. It is also possible to provide several encircling seal rings arranged next to each other.

Fig. 1B shows a sealing device which is modified from the exemplary embodiment of Fig. 1A, wherein the encircling sealing means 7 are embodied as a sealing

element arranged between the facing sides of the two electrodes 2, 2' and are glued together or welded together with the adjoining sides of the electrode bodies 2.1, 2.1'. Here, too, a sort of groove/protrusion connection as in the first mentioned exemplary embodiment is possible. The connecting cables 5 are also conducted here out of the respective electrode bodies 2.1, 2.1' outside of the sealing means 7. Moreover, gripping tongues 4 are also advantageous here in the manner mentioned above.

With the further exemplary embodiment represented in Fig. 3, the sealing means 7 are applied to a cover foil of the two contact areas 2.2, 2.2' and form, for example, a part thereof which has been formed thereon in one piece, or is welded or glued thereon. In this case the cover foil, which constitutes the intermediate layer 6, can be embodied as a single layer with two edge areas separated from each other, or with two layers, each with an edge area, wherein the two layers are advantageously connected with each other for maintaining their positions. The sections projecting laterally past the respective contact areas 2.2, 2.2' are connected with the respective electrode bodies 2.1, 2.1' by connecting means 7.1 and constitute the sealing means 7. Here, too, the connecting means 7.1 can be, for example, a suitable adhesive, or a welded connection for airtight closure. Regarding the attachment of the gripping tongues 4 and the connection with the connecting cables 5, the electrode pack 1 is preferably embodied in accordance with the previously mentioned exemplary embodiments. If, in case of a dual-layer structure of the intermediate layer 6 being made of a foil-like packaging material 3, the connection between the two layers is stronger than the connection of the sealing means 7 with the electrode bodies 2.1, 2.1', the packaging material of the two electrodes 2, 2' is separated from at least one electrode body 2.1, 2.1' and can be easily removed from the electrodes.

With all mentioned exemplary embodiments, the intermediate layer 6 can be advantageously used as a dielectric device in order to perform an automatic electrode test from time to time and to register and assure the functional dependability of the electrodes 2, 2'.